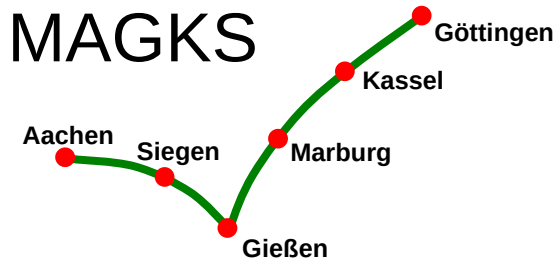

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Clean Evidence on Face-to-Face: Why Experimental Economics is of Interest to Regional Economists

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Clean Evidence on Face-to-Face: Why Experimental Economics is of Interest to Regional Economists[*]

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Abstract

The notion of face-to-face contacts has recently become very popular in regional economics and in economic geography. This is the most obvious way to explain why firms still locate in proximity to others after the "death of distance", i.e., the shrinking costs for transportation, especially transportation of messages' pure information content. While this is intuitive, controlled laboratory experiments provide much more direct and reliable evidence on the importance of face-to-face contacts. They tackle the question what personal contacts are good for, and in which cases their effects are negligible. To the best of my knowledge, regional economists and geographers are not aware of this new and developing string of literature; it is the purpose of this paper to survey and to organize the relevant experimental research with a special focus on its importance for regional economics. However, the paper might also serve to alert more experimentalists to the importance of their work for current regional science, of which they seem not to be aware either.

Keywords: Cooperation, death of distance, face-to-face, localized spillovers, trust

JEL classification: C90, D83, R19

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1. Introduction

A traditional source of localization economies is the cost advantage of local interaction with suppliers, co-operation partners and customers (Marshall, 1890, Book IV Chapter X). During the past 20 years, communicating at a distance has become easier and cheaper, while the variety of technical options has increased. The temporarily popular talk of a "death of distance" (Cairncross, 2001) or "death of geography" turned out to be premature, however. "Many predictions regarding the extinction of face-to-face communication have themselves begun to disappear" (Winger, 2005, p. 247). Possible reasons why a visible weakening of localization economies mostly failed to appear were discussed intensively in regional economics. It is widely agreed that communication often must be face-to-face in order to be effective.[1] But why? The following plausible (and not mutually exclusive) reasons are given in the literature:

- Face-to-face communication might be more efficient, as nonverbal and verbal communication flow at the same time, and immediate feedback helps to quickly remove misunderstandings (Storper and Venables, 2004; Winger, 2005, sections 4 - 6; and Hildrum, 2007, p. 469 with further references).
- As a limiting case, codification of the relevant knowledge might be so poor that there might simply be no other way to communicate meaningfully than face-to-face (Ács and Varga, 2005, p. 326; see Breschi and Lissoni, 2001, pp. 261-262 for some caveats).
- Tibor Scitovsky (1986, p. 70-71) once remarked: "Not surprisingly, perhaps, economists are human. They sometimes do and sometimes do not find what they are looking for, but very seldom they find what they are *not* looking for." The same can be said about other humans. Yet finding out what one was not looking for can be very important and probably happens more often if communication is informal, unstructured and face-to-face.
- A related concept is "buzzing" - members of "sectorally specialized networks" (Rodríguez-Pose and Crescenzi, 2008, p.383) benefitting from, and seeking, the

[1] Of course, face-to-face interaction might be part of a multi-period communication process that also involves e-mails or phone calls for the less complex parts of a joint project, for example, hence face-to-face communication might even be a complement for phone calls (Charlot and Duranton, 2006; Torre and Rallet, 2005, pp.53-54).

geographic proximity of members of other such networks. (The term buzz was prominently introduced into regional economics by Storper and Venables, 2004; see Vang, 2005, or Asheim, Coenen and Vang, 2007, for a critical discussion.)

- Although face-to-face communication is often more efficient than electronic alternatives once it takes place, there are certain launching costs, so to speak, like the time to get to the meeting point; furthermore, possible scale economies of addressing a large number of people within a short time span cannot be utilized. This turns a face-to-face conversation into an investment which only pays off for people who are interested in a long-term relationship. An e-mail (and maybe also even a video-conference) is just too cheap to signal commitment (Leamer and Storper, 2001; Storper and Venables, 2004, p. 356).
- Apart from the previous specific point, face-to-face interaction is generally considered as being necessary for building trust (e.g., Morgan, 2004, McCann and Simonen, 2005)

All this is very plausible, and it is complemented by impressive empirical evidence that knowledge spillovers are bounded within narrow geographical ranges (surveyed by Ács and Varga, 2005, or Döring and Schnellenbach, 2006). However, insights into the microfoundations are still wanting. For example, do face-to-face contacts actually cause an increase in trust, or is this a spurious relationship due to a confounding factor, as suggested by the following phrasing: "Information about novelties flows more easily among agents located within the same area thanks to social bonds that foster reciprocal trust and frequent face-to-face contacts." (Döring and Schnellenbach, 2006, p. 380). Experimental research can contribute to understanding those aspects of face-to-face communication which it touched on so far.

In this survey, I aim to include all relevant economic experiments. In economic experiments, subjects are confronted with clearly defined (often strategic) decision problems, and their decisions are relevant for their actual monetary payoffs. This provisory definition serves as a minimum requirement for inclusion in this survey, and it already excludes most psychological experiments and approaches like role playing (with its unclear structure and lack of incentives)[2]. However, there are additional requirements for good experimental practice often

[2] For attempts to investigate possible effects of face-to-face interaction by role playing see, e.g., Sheffield (1989), Moore et al. (1999), Drolet and Morris (2000) and the references given therein on p. 27 and 29.

followed by economists (Hertwig and Ortmann, 2001) on which I decided to be less strict. For example, unlike psychologists, economists usually do not deceive subjects (concerning rules, payoffs, opponents' incentives etc.)[3]. In one paper covered in this survey, otherwise an economic experiment, this rule is broken for the purpose of gaining more relevant observations. Furthermore, economists often give subjects the opportunity to learn, using training rounds and/or repetitions of the same experiment to minimize the possibility that subjects misunderstand the rules and hence do not play the game actually intended by the experimenter. However, if one-shot experiments are really simple, their results can be meaningful, as is surely the case for those discussed below. Finally, most economists let their subjects interact anonymously. Otherwise "the possibility of postgame interaction, positive or negative, may influence decisions." (Eckel, 2007, p. 846n) Face-to-face experiments, however, cannot be completely anonymous, but in these cases experimenters take care that subjects paired together are strangers with a low probability of meeting again.

It remains to be clarified what a "relevant" experiment is in our context. A number of experiments have compared only completely anonymous interaction to face-to-face interactions (e.g., Dawes et al, 1988; Roth, 1995; Schmidt and Zultan, 2005; Valley et al, 2002). The results are interesting in their own right, but they are meaningless for regional economics. This begs the question what is lost when face-to-face interaction is substituted by communication via the Internet, where partners are at least known by name.

However, this would be a short survey if the only evidence were those experiments that directly compare face-to-face interaction with other communication channels, such as e-mail. Valuable insights can also be gained from indirect evidence. For example, as face-to-face contact requires more spontaneous reactions, what is the effect of spontaneity - i.e., decision time - in controlled experiments? This will be discussed in section 2. Section 3 reports on experiments that show whether and how much trust and cooperation increase due to face-to-face interaction (3.1), and on experiments that shed some light on single features of face-to-face communication, such as smiling and eye contact, that might be responsible for the effects. Section 4 concludes with a brief look at the implications for regional economics.

[3] A special case are field experiments, where subjects are not aware that they are taking part in an experiment, which can be considered as an advantage, leading to more external validity.

2. Spontaneity

> *Meeting B over lunch, A makes a "final offer: $1000 for the equipment". B rejects by replying: "It's been a pleasure to meet you", evidently not meaning what he says, and walks away.*
>
> *C writes an e-mail to D, making a "final offer: $1000 for the equipment". D writes back: "Sorry for the late reply. In yesterday's e-mail you offered next to nothing, yet I accept, what can I do?"*

If negotiations do not take place face-to-face, but via mail or e-mail, there is an automatic "cooling off period". If we are informed, by suitable experiments, on the effects of cooling off periods, we also get an idea about a certain aspect of face-to-face negotiations.

The first controlled economic experiment on the effect of a substantive cooling off period in an experiment was invented by Oechssler, Roider and Schmitz (2008). Proposers in a mini-ultimatum game offered a 8:2 split or a 5:5 split. Responders decided whether to accept or reject. 24 hours later they were (surprisingly) given the chance to revise their decision. In one treatment, when possible payoffs were sure payments of 2, 5 or 8 euros, respectively, a cooling off period lowered the rejection rate neither markedly (from 42.6% to 39.4%) nor significantly. Yet in an alternative treatment with the same expected payoffs but more potential for temptation and regret (payoffs were designed as chances for a high price in a lottery), a cooling off period led to a large and significant drop in the rejection rate, from 27.7% to 20.5%.

If, compared to usual laboratory conditions, a cooling off period leads to a lower rejection rate, increased time pressure might well increase the rejection rate. And this is exactly what Sutter, Kocher and Strauß (2003) find. When responders had 10 seconds instead of 100 seconds for their decision, the rejection rate increased from 40.3 to 78.2 percent (while offers received were about the same for both groups of responders). Cappelletti, Güth and Ploner (2008) recently also found higher rejection rates under time pressure (30 versus 180 seconds in a slightly more demanding design). The latter team of authors introduced time pressure in order to increase the weight of the affective system relative to the deliberative system, as the latter, located in a different neural area, takes more time. Hence they are conducting basic neuroeconomic research, but their results are also important in our context: compared with other settings for negotiations, a face-to-face interaction is most likely to require, or to provoke, spontaneous reactions. If spontaneity is typical for face-to-face interactions and if

cooling off periods are typical for other types of negotiation, then all experimental evidence suggests that we should expect more rejections face-to-face.

Considering proposer and responder only, increasing rejection rates decreases efficiency. Anything that decreases rejection rates is welcomed by proposers, who can react by lowering their offers. On the other hand, anything that increases rejection rates is favored by responders, as far as proposers correctly anticipate the increased rejection likelihood and react accordingly. Hence we find that some negotiators should favour face-to-face interaction, some should not. From a regional economics perspective, if bargaining breaks down more often in face-to-face negotiations, the sum of proposers' and responders' payoffs is lower in agglomerations with a lot of face-to-face contact. However, two qualifications come to mind:

First, the fact that face-to-face negotiations are bad for the proposer is somewhat counter-intuitive. Yet note that the proposer is not always a seller who wants to use the situation to get a quick (positive) reply from a surprised buyer. In the example at the beginning of this section, the proposer is a prospective buyer.

Second, the ultimatum game is a very stylized negotiation. Usually something like a counteroffer should be possible.

Yet a cautious conclusion might be put this way: inspecting available experimental evidence for mechanisms that makes agglomerations, and hence a lot of face-to-face contacts, more attractive, the spontaneity of this type of interaction alone was not identified as a very likely candidate.

3. Trust and cooperation

> *A, B, C, D and E meet over lunch. "Each of our firms benefits equally from this platform if we get it started", A remarks. "Yes, and the benefit is larger the more effort we put into it by the end of this year", B replies. All feel they should contribute considerable effort.*
>
> *F, in an e-mail to G, H, I and J, remarks: "Each of our firms benefits equally from this platform if we get it started." G replies: "Yes, and the benefit is larger the more effort we put into it by the end of this year". And it is even larger for me, H thinks, if the others do most of the work while I take care of my own business.*

3.1. Measuring increased trust and cooperation in face-to-face experiments

Trust and cooperation are hard to disentangle. Conditional cooperators contribute to a group's public good if they expect others to do so, trusting that they will not egoistically exploit their strategic position. Hence many experimental designs do not allow one to be measured entirely without the other. It is difficult enough to measure trust and cooperation together even in simple experiments; the work by Valley, Moag and Bazerman (1998) is a case in point.

They study bilateral negotiations with asymmetric information. Two subjects negotiate the price per share which the seller gets for a firm that henceforward, according to the experiment's framing, is to be managed by the buyer. There is something that only the seller knows: the true current value V of each share. From the buyer's perspective, it is equally distributed between $ 0 and $ 100. Furthermore, the buyer knows that the new value, once the firm is under the buyer's management, will be 1.5 times larger than the former value V. Hence selling the shares leads to a Pareto improvement[4]. However, the buyer should not bid for the shares. For any bid B, the seller will only accept if B > V. Getting the shares at price B means that the value for the buyer must be equally distributed between 0 and 1.5B. Hence the expected value is lower than B, and the buyer should refrain from bidding unless he receives reliable information about V.

[4] In the experiment, described below, subjects in the role of seller earned $ 0.2(sale price - V), buyers earned $ 0.2(1.5·V - sale price). Additionally the authors report on a very similar experiment without monetary incentives, of which the main results are in line with the ones described here.

Simply asking the seller does not help from a purely game theoretic perspective, as the seller might lie. However, the seller is significantly less likely to lie in face-to-face interaction, only in 1 of the 14 (or 7%) negotiations that were taped, the seller lied about V, compared to 55% for telephone negotiations and 33% for (non-anonymous) written negotiations. Some buyers failed to take advantage of the features of face-to-face negotiation, however, and bid without asking for V. In these cases, sellers did not have to lie in order to get a price at which buyers lost money. Nevertheless, face-to-face interaction resulted in the highest number of Pareto improving deals[5].

Other experimental designs are more straightforward with respect to the effects of face-to-face communication. Frohlich and Oppenheimer (1998) let groups of 5 people play a 15-round multilateral prisoner's dilemma without any previous communication, with e-mail communication before each of the first 8 rounds, or with face-to-face communication before each of the first 8 rounds. In every round, each player can give any amount between 0 and 10 to the group, keeping the rest. The sum of all contributions is multiplied by 0.4, and each player receives the resulting amount. Without communication, each player gives 2.9 on average over rounds 1 to 8, being closer to the individually rational contribution of 0 than to the Pareto efficient contribution of 10. (If everyone contributes 0, everyone gets, or rather keeps, 10 per round. If everyone gives 10, everyone gets 20 per round.) With e-mail communication before each round, the average contribution in rounds 1 to 8 is higher: 7.6 on average. Yet with face-to-face communication it is even higher: 9.99!

Two things are noteworthy, however. First, from round 9 on, communication was no longer possible. Contributions in groups with previous face-to-face communication quickly collapse to the level of the e-mail-groups (that also may no longer communicate), reaching the low level of the no communication group in the final round. It is an open question how persistent face-to-face communication should be to be effective; in two studies reported on further below, face-to-face communication took place only before the first round, but its effects lasted throughout the experiment (Brosig, Ockenfels and Weimann, 2003; Bochet et al., 2006). That a marked cooperation breakdown is observed only by Frohlich and Oppenheimer (1998) is

[5] This holds true for 57.1% of all face-to-face negotiations (out of n=21), which is significantly higher than the share of 22.2% reached for written communication. Yet the difference is not significant for comparison of face-to-face and telephone communication (38.1%). The latter however, showed a significantly higher share of buyer's losses (47.6%) than face-to-face and written communication (23.8% and 25.9%, respectively). With an impasse rate of 52%, written communication brought negotiations closest to the theoretical prediction.

possibly due to the fact that round 9 to 15 came unexpectedly for their participants[6]; the restart effect might have destroyed any previously accumulated feelings of group solidarity.

Second, Frohlich and Oppenheimer (1998) also try the "impartial PD", a game in which there is no conflict between individual and social rationality. The only problem is that this is not easy to comprehend for all participants. Purely self-interest reasoning, if correctly performed, will suffice to make participants give the full amount of 10. Here it is the purpose of communication not to build up empathy and trust, but to dispel any misunderstanding. Under these circumstances, face-to-face and e-mail communication work equally well (and better than no communication at all).

Whereas the conflict between social and individual rationality clearly vanishes in this alternative design by Frohlich and Oppenheimer (1998), Arunachalam and Dilla (1992, 1995) perform an experiment which features a bit of this conflict, but much less than in a prisoner's dilemma. Three subjects get paid if, and only if, they unanimously agree on one of 625 possible allocations (framed as vectors of transfer prices and further conditions for one upstream and two downstream divisions of a firm.) A majority of the allocations are Pareto efficient, and negotiations are severely hampered by the fact that every player only knows his own payoffs and may not communicate his payoff schedule. A random allocation would lead to a payoff of 6,600 points (leading to a $ 1.32 payoff) per subject, in the Kaldor-Hicks optimum each would get 9,800. Playing the game with a 25-minute face-to-face communication phase leads to an average payoff of 7,270, compared to 7,018 for non-anonymous computer mediated communication (chat) of equal duration. This small difference probably just reflects the speed disadvantage of electronic communication.

Independently of Frohlich and Oppenheimer (1998), a similar experiment was investigated by Rocco (1998). Groups of 6 participants played 28 rounds of an experiment where the Nash equilibrium was Pareto dominated[7]. Face-to-face communication after rounds 10, 15 and 20 effectively helped participants to deviate from the individually rational decision and maximize group welfare instead in the second half of the experiment. E-mail communication among strangers, however, did not result in better cooperation. E-mail communication among people

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[6] I owe this point to Jeannette Brosig.

[7] In each round, everyone received 13 tokens and "invested" some of these, payoff being proportional to own number of tokens divided by total number invested by the group. In the Nash equilibrium, everyone invests 10 tokens. The sum of payoffs is highest when everyone invests 6.

who had tried to solve a group task in face-to-face interaction on the day before the experiment was almost as successful in achieving cooperation as face-to-face interaction.

Bochet et al. (2006) perform a four-person 10-round public goods game, comparing face-to-face interaction (lasting 5 minutes before the start of round 1) with a chat room treatment, allowing online discussion before the 1st, 4th and 7th round, though messages revealing the players' identity, threatening or offering side-payments were blocked. They find a lower difference between these two treatments than expected (according to Bochet al al, 2006, p. 12); an average contribution of 81.4% of the endowment with chat room communication, compared to 96.2% face-to-face, averaged over 10 rounds. Yet at least, in round 10, the average contribution has dropped to 78.1% of the endowment in the face-to-face treatment, but to 52.1% in the chat room treatment.

The most recent contribution to this line of research, with fairly unsurprising results, is by Naquin, Kurtzberg and Belkin (2008), who perform a threshold public goods game; in a group of four, everyone gets two $7 certificates for meals in campus eateries if, and only if, at least three members contribute their initial endowment of one such certificate. Communicating non-anonymously via e-mail before their decision, 35.8% of the participants contributed to the group's public good, while face-to-face communication led to a 69.9% contribution rate[8].

3.2. Experimentally detecting conditions and reasons for increased trust and cooperation

Alternatives to e-mail

Compared to the Frohlich and Oppenheimer (1998), a greater variety of communication channels is employed in Brosig, Ockenfels and Weimann (2003) in a standard (4-person 10-round) public goods game (also reported on in Brosig, 2006). This leads to additional insights concerning the triggers of trust and cooperation, although unfortunately they do not have a

[8] In addition to their public good experiment, Naquin, Kurtzberg and Belkin (2008) performed a second study, yet without monetary incentives and with loaded instructions: Subjects were put into the shoes of either a large commercial fisher, a small commercial fisher, a recreational competitive fisher or a recreational tour fisher. They were asked by how much they would be willing to reduce their harvesting from a shark population, which would be depleted if everyone remained at his or her (group-specific) default value. Non-anonymous e-mail communication reduced the group harvest to 71% of the default value, compared to 55% for face-to-face communication. The interesting point about this study is that subjects were questioned about their perceived justification for being uncooperative, which is stronger for e-mail communication, contributing to the lower level of cooperation for this mode of communication. A replication with monetary incentives and a design without role-playing would be highly desirable.

treatment with e-mail communication. The main finding is that audio communication, compared to anonymous play, does not significantly increase the level of cooperation (on average, 48 and 57 percent, respectively, of the endowment are contributed to the group). Compared to these levels, video transmitted communication and face-to-face communication lead to higher levels of cooperation: 93 and 97 percent, respectively, which are not significantly different from each other.

Furthermore, pure identification (photographs of the group members being shown for ten seconds before the game starts) did not lead to higher cooperation than purely anonymous play. Hence the obvious question is: What is it that video transmission can do which audio communication and photographs cannot?

Smiling

A possible candidate is the opportunity to smile. Scharlemann et al. (2001) find that people put more trust into others who are smiling. They play a variant of the trust game (Berg, Dickhaut and McCabe, 1995), in which their subjects (in the role of Player 1) have the choice between immediately getting £1 (with payoff of Player 2 being £0.50) or trusting Player 2, who then has the choice between rewarding the trust or not rewarding the trust. In the latter case, he gets £1.25, but Player 1 gets only £0.80. If Player 2 rewards the trust, his payoff is slightly lower (£1.20), but Player 1 also gets £1,20. Actually all subjects take the role of Player 1 and believe that their partner (Player 2) is a real person, and they are shown a photograph of Player 2. However, the photographs were from a Psychological Image Collection, with a smiling and a non-smiling picture taken from every model. Any time that a Player 1 trusts Player 2, the computer simulates a "rewarding trust" decision of the presumed Player 2. This is the only experiment in this survey where subjects are deceived, something that is usually considered inappropriate in experimental economics (Hertwig and Ortmann 2001, section 5). However, Scharlemann et al. (2001) argue that subjects were paid as promised, and real partners would not have changed their (perceived) choice situation, but would have made it more difficult to control their transmitted facial expression and to precisely measure the impact of a smile. If Player 2 does not smile, s/he is trusted, on average, in 55.0% of the decisions by Player 1. If Player 2 smiles, this rate increases to 68.3%.

Eye contact

A number of studies have shown that eye contact matters very directly. Compared to the completely anonymous control group, the difference is not real face-to-face interaction, but a simple image intended to activate the brain's eye-detection system. Specifically, the picture chosen by Burnham and Hare (2007) for this purpose shows 'Kismet', a robot invented at MIT with a typical metallic robot face but humanoid eyes. The authors let subjects play 6 rounds of a four-person public goods game, where no one meets the same counterpart twice. In every round, each player gets 10 tokens (equivalent to US-$2) and can place any amount between 0 and 10 into the group account. The amount is then doubled and divided between the four group members, which makes keeping the whole amount the dominant strategy. Averaged over subjects and rounds, the amount given in the control group is 4.17; in the experimental group, with 'Kismet' shown on the screen during the experiment, it is 5.39, a (statistically significant) difference of 29%.

Working with a very similar difference between experimental and control group, Haley and Fessler (2005) let students play a dictator game, in which Player 1 (the "dictator") had to decide how to divide $10 between himself and Player 2, who has no active role in the experiment. The control group had the laboratory's label on the computer monitor, while for the experimental group, a stylized drawing of a pair of eyes appeared. On average, the amount allocated by Player 1 to Player 2 was $ 2.45 in the control group, but $ 3.79 in the experimental group, a difference mainly due to the higher share of people who gave a positive amount in the eyes group (0.88 versus 0.55).[9]

Bateson, Nettle and Roberts (2006) design an impressively simple field experiment and obtain evidence that confirms the laboratory studies. In a coffee room shared by 48 university staff members, they placed a poster showing the image of a pair of eyes in some weeks, and a flower poster in others. Payments for tea, coffee and milk in the room were made via an "honesty box", a system that has no sanctions for non-payment, although prices were clearly

[9] Rigdon et al. (2008) also play a dictator game, using a very schematic face - three dots that look remotely like a face ordered like the corners of an equilateral triangle - on the money allocation sheets where dictators in the experimental group had to state their decision. Sheets for the control group were similar, except that the three dots were rotated 180 degree (∴). Transfers by male dictators were about twice as high in the experimental group, compared to males from the control group, while no such effect was observed for females. This is puzzling, as no gender effect was found by Haley and Fessler (2005). As the stimulus used by Rigdon et al. (2008) is much more abstract than in the other studies discussed in this section, the gender effect might be a specific curiosity with low importance for real face-to-face interactions.

suggested. Actual payments were markedly, and statistically significantly, higher in weeks with eyes.

Given that the comparison of minimal social cues and no social cues turns out to be so impressive, why did the photographs of the participants in the experiments by Brosig, Ockenfels and Weimann (2003), described above, not enhance cooperation? One possible explanation would be that these photographs were not shown while the decisions were made, but before the game - this hypothesis would be in line with the Frohlich and Oppenheimer (1998) result, reported on in section 3.1, that face-to-face communication must be persistent to a certain degree to have an effect.

Anyway, it would be wrong to suggest that eye contact alone, even if it is appropriately timed, should be sufficient to induce *full* cooperation. Frey and Bohnet (1995) perform a four-person prisoner's dilemma game where participants could only choose between cooperation and defection (also reported in Bohnet and Frey, 1995, 1999). They find that visual contact alone, with no talking allowed between players, significantly raises the cooperation rate, compared to complete anonymity, from 12% to 23%. Yet visual contact *plus* the chance to talk to each other had a much larger positive effect (a 78% cooperation rate). A similar two-person prisoner's dilemma experiment by Wichman (1970) yielded a similar, though less pronounced, result. Anonymity resulted in a 40.7% cooperation rate, visual contact alone in 47.7%, only hearing each other[10] in 72.1%, while unrestricted face-to-face contact led to a 87.0% cooperation rate, averaged over 70 rounds with fixed partners.

Detecting lies

"Going 'eyeball-to-eyeball' is the typical business characterization of how to find out what someone truly has in mind in their conversations with others" (Winger, 2005, p. 249). Are lies really written in the liar's face? Wang, Spezio and Camerer (2008) let students play a sender-receiver game (Crawford and Sobel, 1982), in which senders have private information about a true state of nature, and often have an incentive to communicate it incorrectly to a receiver (i.e., to lie). While making their decisions, they were closely monitored. Specifically, their eye movements and pupil dilation were recorded. When subjects lied, their pupils expanded -

[10] Which does not mean audio communication like in the study of Brosig, Ockenfels and Weimann (2003) discussed above; subjects were just separated with a cardboard partition, which might contribute to differences between these two studies' results.

more so the "larger" the lie. This does not necessarily tell us something about an advantage of face-to-face communication, as eye-tracking systems are absent in communication outside of certain laboratories. However, if there is something in the face about lying which can be measured, there might also be something that can be intuitively felt.

A typical psychological experiment on detecting lies goes like this (Vrij, 2008): one person is asked to lie (i.e., knowingly tell something s/he knows not to be true), and observing this, another person tries to find out whether the truth was told or not. The major step towards an economic experiment is made when the first person has a material incentive to lie, and the second person has a material incentive to guess correctly.

The latter aspect is still absent in an original experiment by Frank, Gilovich and Regan (1993). They let each subject play a one-shot two-person prisoner's dilemma against each of two further subjects, with whom they meet for 30 minutes before the decision was to be made. Promises could be made but were not enforceable - there was no sanction for lying. After these meetings, subjects were separated and asked to predict the other two players' decisions whether to cooperate or defect. These predictions turned out to be better than random guesses. However, the face-to-face meetings were not monitored. It cannot be ruled out that a few subjects were truthful about their intention to defect. In this case, the ability to detect lies would not be needed to explain their findings (Ockenfels and Selten, 2000, p. 91). While this point has been partly invalidated by Brosig (2002), who was able to sort out subjects announcing their defection from the sample in her replication of the Frank, Gilovich and Regan (1993) study, one further problem remains if we want to compare face-to-face interaction with alternatives such as e-mail: just like some false promises can be detected in a conversation, a few written lies might also be been detected.

The typical psychological design previously sketched was paired with clear monetary incentives by Bond et al. (1985): subjects were paid more if they successfully lied about their last job, "success" depending on the number of detections by fellow subjects who were also paid depending on their success. These observers were right in 63.33% of all cases, compared to a 50% expected for random guessers. However, this success is not necessarily due to the fact that interaction was "almost" face-to-face, i.e., via videotape. Liars might also be detected because of unintended verbal cues (Ekman, 1985, pp. 87-92; Vrij, 2008, ch.4) that might be transmitted via telephone or even e-mail as well.

Ockenfels and Selten (2000) performed an experiment which produced clearer results. They let two people freely negotiate over the division of DM 30 (about 30 euro). One of them has private information whether s/he has "costs" of DM 12, to be deducted from his share, or not. S/he can realistically only hope to get more than the "fair" share of DM 15 if s/he claims to have costs, whether this is true or not. Hence some have an incentive to lie. Onlookers observing the negotiation are provided with an incentive to guess correctly who had costs - in other words, they had an incentive to detect lies. There was no control group in this experiment, but the relevant information was essentially binary, hence it is very reasonable to presume if it were performed using written communication only, guessing who is lying would be very difficult, resulting in a success rate of about 50%.

The finding by Ockenfels and Selten (2000) was that two objective features of the negotiation (an extremely quick agreement, or acceptance of a lower share by people without costs) sometimes helped onlookers to find out about true costs of the negotiators. Excluding these cases, the success rate was even below 50% (slightly but significantly). Live observation of the negotiation alone did not lead to a better than random guess about who was lying.

4. Discussion

Table 1 briefly summarizes the results surveyed in this paper.

Taking all experiments surveyed here together, the clearest result is that face-to-face communication, compared to e-mail communication, increases trust and cooperation. This is not only in line with the presumption of regional economists referred to in section 1, it is also in line with folk wisdom - "face" was a synonym for credit in 18th century slang, "to travel on one's face" meant to go upon credit (Partridge, 1972).

Table 1: Overview of the main findings

Topic (section)	Finding		Source
spontaneity (2)	presumably increased in face-to-face situations, which does not increase efficiency		Oechssler, Roider and Schmitz (2008), Sutter, Kocher and Strauß (2003), Cappelletti, Güth and Ploner (2008)
trust and cooperation (3.1)	typically increased in face-to-face interaction, compared to e-mail or chat room		Valley, Moag and Bazerman (1998), Frohlich and Oppenheimer (1998), Naquin, Kurtzberg and Belkin (2008), Rocco (1998), Bochet, Page and Putterman (2006)
	typically increased in face-to-face interaction, compared to audio communication		Valley, Moag and Bazerman (1998), Brosig, Ockenfels and Weimann (2003)
	not increased in face-to-face interaction, compared to video conferencing		Brosig, Ockenfels and Weimann (2003)
inducement for increased trust and cooperation (3.2)	smiling	causes part of the increase	Scharlemann et al. (2001)
	eye contact	causes trust to increase (share of contribution of face-to-face effect unclear)	Burnham and Hare (2007), Bateson, Nettle and Roberts (2006), Haley and Fessler (2005), Rigdon et al. (2008)
	lie detection	evidence negative or inconclusive	Wang, Spezio and Camerer (2008), Frank, Gilovich and Regan (1993), Bond et al (1985) Ockenfels and Selten (2000)

Yet there is more in the experimental evidence than mere affirmation. Most importantly, does every alternative to face-to-face communication perform as disappointingly as e-mail? As Winger (2005, p.250) puts it: "What is coming is (...) something that, by configuring bits of information, will give us images that have the characteristics of what we experience in physical settings." A possible consequence is this: "Advances in telecommunication technologies may restrict face-to-face meetings to interactions of the very highest quality." (Charlot and Duranton, 2006, p.1385). With experimental support, this could be put more concretely: videoconferencing might be a substitute for face-to-face-communication when it

comes to ensuring trust and cooperation[11]. Yet evidence is too sparse here; this part of the Brosig, Ockenfels and Weimann (2003) study surely deserves a replication[12]. A new alternative to videoconferencing are avatar meetings on platforms such as Second Life (www.secondlife.com). A series of standard economics experiments has been replicated by Chesney, Chuah and Hoffmann (2007) on Second Life, yet without a nonvirtual face-to-face control group.

As already mentioned, it was not the explicit purpose of the experiments covered in this overview to contribute to regional science. The design did not respond to specific questions regional economists might have. Looking back on the list of possible reasons for the necessity of face-to-face interaction in section 1, "buzzing" and, more generally, interactions with some random, unplanned and undirected communication, do not in any obvious way lend itself to a controlled laboratory experiment. Two other points from that list, however, deserve experimentalists' attention.

First, how to measure the effects of richer signal transmission via face-to-face communication in the laboratory? One suggestion would be to allow a reduced face-to-face communication, with the eyes covered. The results would nicely complement existing knowledge about the isolated effects of smiling or eye contact, both of which have been shown to enhance trust and cooperation (section 3.2). Maybe sunglasses would be sufficient to show an effect. Going to the extreme, one could cover subjects' faces completely with a mask, maybe with a neutral photograph of their face on it, and let them communicate with a device like Stephen Hawking's. This would definitely reduce all advantages of face-to-face contact with respect to communication efficiency; any remaining effects, programmed in the course of human evolution, would be directly due to the physical presence of the other(s).

Second, the idea that face-to-face communication as a means to signal commitment could be implemented very directly in the laboratory. Let subjects have the choice whether to communicate cheaply via e-mail at a distance, or to carry the costs of meeting each other, although communication would still not be face-to-face but via artificially "expensive" e-mail.

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[11] See Miller and Storper (2008), section 2.1, for a comprehensive discussion and some caveats.

[12] At least there is already support from a case study on a specific inter-firm collaboration: "According to several project members, the group would have needed more face-to-face meetings to solve these problems had it not been for the video meetings." Hildrum (2007), p.479

Of course, these are only tentative hints. If experimentalists take up the current interesting challenges from regional economics, and if regional economics theorize in response to experimental results, a broad variety of exciting new insights is bound to emerge.

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